

Patent claims

1. A tone signal detection circuit for a receiving
circuit for detecting at least one tone signal
5 having a predetermined tone signal frequency (f_E)
which is contained in a received analog input
signal, comprising:
- (a) a reference signal generator (41) for
10 generating an analog converter reference
signal V_{ref} which consists of a reference DC
(V_{refDC}) and a periodic reference AC (V_{refAC})
having a variable fundamental frequency (f_G),
which is superimposed on the reference DC
15 (V_{refDC});
- (b) an analog/digital converter (11) for
converting the analog input signal into a
digital data stream in dependence on the
20 analog converter reference signal (V_{ref}); and
comprising
- (c) a digital control circuit (20) which adjusts
25 the variable fundamental frequency (f_G) of
the reference signal (V_{ref}) generated by the
reference signal generator (42) in accordance
with the predetermined tone signal
frequencies (f_G) of the tone signals to be
30 detected and evaluates the digital data
stream output by the digital analog/digital
converter (11) for detecting a data pattern
corresponding to the tone signal.
2. The tone signal detection circuit as claimed in
35 claim 1, wherein the reference signal generator
(41) exhibits a reference voltage source (51) for
generating the reference DC (V_{refDC}),

a controllable signal generator (42) for generating the periodic reference AC signal (V_{refAC}) in dependence on a fundamental-frequency adjusting signal, received by the digital control circuit (20), for adjusting the fundamental frequency (f_G), and an

adder which adds the reference DC (V_{refDC}) to the periodic reference AC (V_{refAC}) for forming the converter reference signal (V_{ref}).

3. The tone signal detection circuit as claimed in claim 1 or 2, wherein the digital control circuit (20) contains a zero transition counting device (28) which counts the number of zero transitions of the digital data stream output by the analog/digital converter (11), the digital control circuit (20) detecting a tone signal when the number of zero transitions per time corresponds to a predetermined nominal zero transition rate.
4. The tone signal detection circuit as claimed in one of the preceding claims, wherein the various nominal zero transition rates of the tone signals to be detected can be adjusted in the digital control circuit (20).
5. The tone signal detection circuit as claimed in one of the preceding claims, wherein the digital control circuit (20) contains a comparator circuit (24) with adjustable signal threshold values.
6. The tone signal detection circuit as claimed in one of the preceding claims, wherein the digital control circuit (20) exhibits a digital band-pass filter (22) for band-pass filtering the digital data stream.

7. The tone signal detection circuit as claimed in one of the preceding claims, wherein the detected tone signals are temporarily stored in a memory (32) of the digital control circuit (20).
8. The tone signal detection circuit as claimed in one of the preceding claims, wherein the digital control circuit (20) outputs a corresponding interrupt signal to a central controller (36) of the receiver circuit, with a predetermined tone signal combination which consists of at least one tone signal.
9. The tone signal detection circuit as claimed in one of the preceding claims, wherein the analog/digital converter (11) contains a digital filter and a decimation filter.
10. The tone signal detection circuit as claimed in one of the preceding claims, wherein the received analog input signal is an xDSL signal.
11. The tone signal detection circuit as claimed in one of the preceding claims, wherein the receiver circuit is a modem receiver circuit.
12. The tone signal detection circuit as claimed in one of the preceding claims, wherein the modem receiver circuit switches the receiver circuit from a standby mode to a data reception mode by means of the central controller (36) on reception of the interrupt signal from the digital control circuit (20).
13. The tone signal detection circuit as claimed in one of the preceding claims, wherein the digital/analog converter (11) is preceded by an anti-aliasing filter (8).

14. The tone signal detection circuit as claimed in one of the preceding claims, wherein the anti-aliasing filter (8) is preceded by an automatic gain control circuit (5).

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15. The tone signal detection circuit as claimed in one of the preceding claims, wherein the digital data stream output by the analog/digital converter (11) is evaluated by a following data processing circuit of the receiver (17).

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16. The use of an analog/digital converter (11) as mixing stage for mixing an analog input signal with an analog reference signal.

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17. The analog/digital converter as claimed in claim 16, wherein the analog/digital converter (11) converts the analog input signal into a digital data stream which is evaluated for detecting an analog tone signal.

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